



Riggs (C. E.)

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NATIVES IN OPTIC NERVE  
ATROPHY.

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BY CHARLES EUGENE RIGGS, A. M., M. D.

Member of the American Neurological Association; Member  
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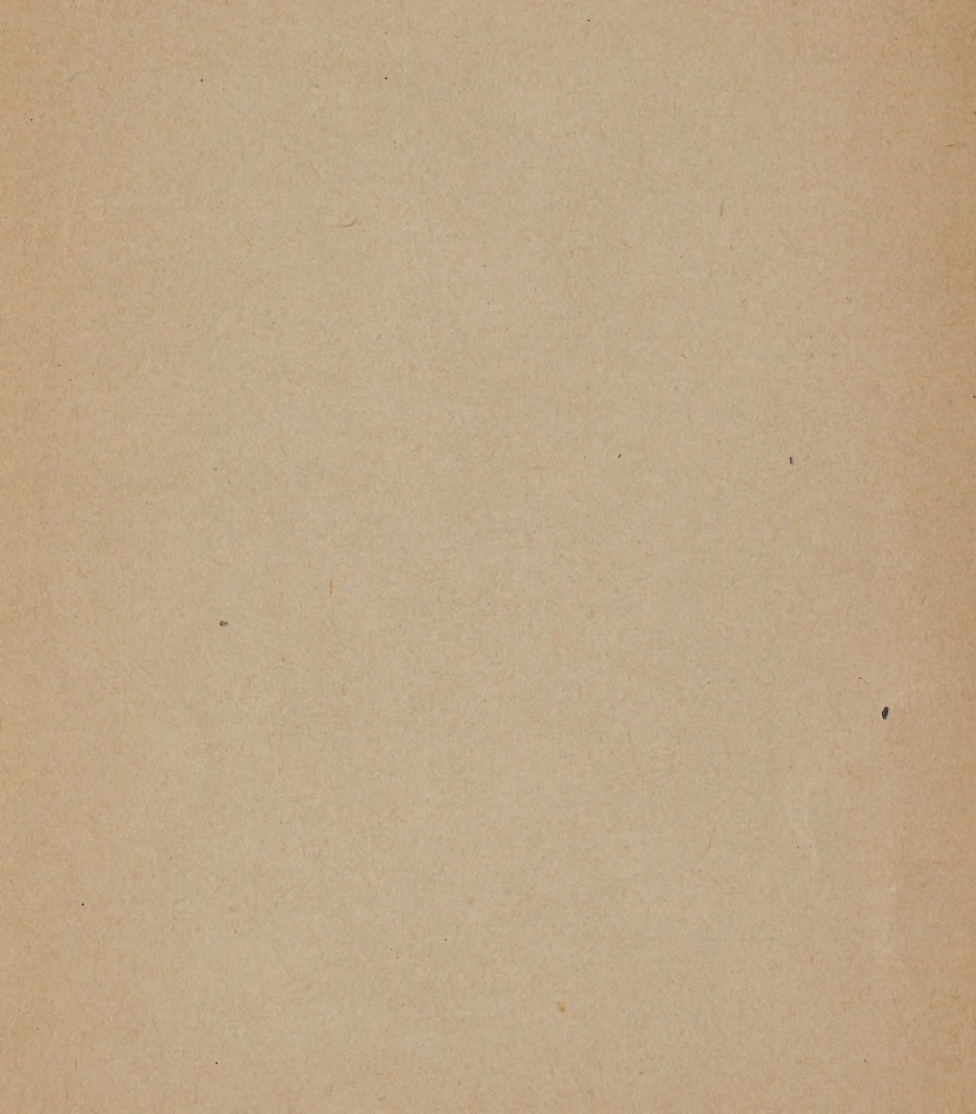
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# THE VALUE OF VOLTAIC ALTERNATIVES IN OPTIC NERVE ATROPHY.

BY CHARLES EUGENE RIGGS, A. M., M. D.

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My attention was first called to the value of voltaic alternatives in atrophy of the optic nerve by Dr. Webster Fox, of Philadelphia, who said that he had obtained from their use some results so surprising that he hesitated to publish them because he felt they would be received incredulously by the profession.

This strong recommendation from so eminent a man resolved me to make trial of them in my own practice should occasion arise, but for some time I was deterred from the habitual use of them by the fact that in the ordinary instrument the only way of alternating the currents is by the hand, which is not only tiresome in the extreme but also undesirable, as the frequent use of the commutator in this manner renders the battery unreliable for careful diagnostic work. Also in using the hand the precision of the make and break will necessarily vary a little in force; consequently there will not result the same smoothness of current as though the action were automatic. To remedy this defect I requested Dr. H. E. Waite to construct for me an automatic commutator, a cut of which is appended, which has proved satisfactory in every way.



I first tried the voltaic alternatives upon a patient sent me by Dr. Graham, of Minneapolis. He reported that when first examined he found the media clear, hyperæmia of the optic disc, with outlines slightly blurred, veins somewhat enlarged and arteries reduced. The treatment before the use of the voltaic alternatives had been iron, quinine and strychnia, with no improvement resulting. After the use of voltaic alternatives had

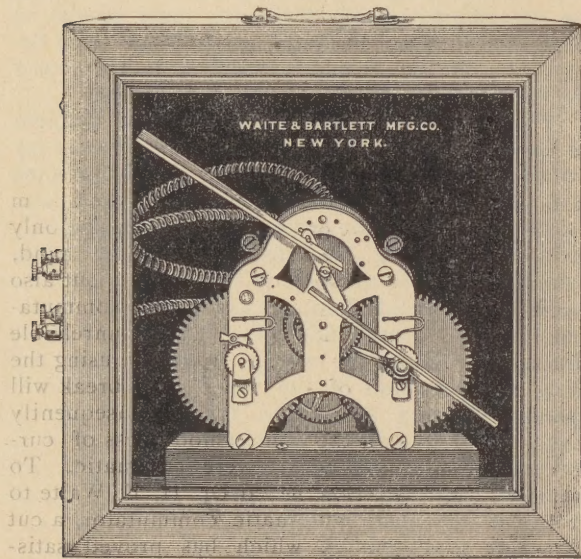


FIG. I.

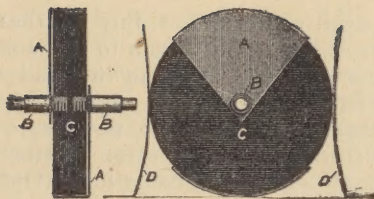


FIG. II.

Figs. 1 and 2 show two views of a new automatic pole-changer for use in the application of voltaic alternatives, made by the Waite and Bartlett Mf'g Co. at my suggestion. It has three sets of fans for regulating the speed. With the large fan the polarity is changed 150 times a minute; with the medium, 200, with the small 250. C is a hard rubber wheel. B and B form the shaft but do not touch each other. A and A are pieces of brass bent like D; they are fastened on opposite sides of the wheel C, and connected to the shafts. D and D represent two brass springs which press on the wheel C, so that as C revolves the brass pieces A and A touch the springs D and D at the same time.

been begun she improved very slowly, by almost imperceptible degrees. She was under this treatment for two or three months, and examinations made in the meantime by Dr. Graham showed unquestioned improvement in the eye condition. At the end of this period she was obliged to leave the city, but wrote me six months afterwards that the improvement had been continuous and was still going on.

For the next case which I treated I was indebted to the courtesy of Dr. E. H. Wood, of St. Paul. I subjoin the report of the case as taken from Dr. Wood's notes.



"J. W., aged 52, farmer. July 26, 1891. Says six months ago eye-sight began to fail and 'everything looked milky.' No pain in head or eyes.

"Examination. Vision in right and left only counts fingers at ten feet; not improved by glasses. Cornea clear, tension normal. Pupil acts to light and accommodation. Ophthalmoscope shows both optic discs very pale, medium-sized physiological cup, blood-vessels medium-sized, vitreous clear, rest of fundi normal. No history of injury or syphilis. Says memory is getting very poor, and that he often forgets what he came to town for. Has numbness of legs and arms, spastic contraction of fingers, no ankle-clonus, but there is increased knee-jerk in right and diminished in left leg. Diagnosis, atrophy of optic nerve. Treatment: Elixir of zinc, iron and strychnia, hypodermic of strychnia in temples and electricity, also large doses of potassium iodide.

"Aug. 14, R. V.—6-36. L. V.—6-60.

"Aug. 27, R. V.—6-24; plus 1.5 D.—6-9. L. V.—6-36.

"Not improved by glasses. Patient returned home."

My examination of the man confirmed the existence of the nervous trouble indicated by Dr. Wood. The result of the use of voltaic alternatives in this case was most astonishing. After the first week's treatment the patient declared himself decidedly improved, and the improvement was rapid and continuous while he remained under my care. That the improvement was permanent is



witnessed by the subjoined note of Dr. Wood, who made a special reëxamination of the case for the purposes of this paper a few weeks ago.

"Sept. 4, 1892: Examined him and found that he had been working most of the time; said memory continued good, numbness and spastic contraction did not return and that his eye-sight remained about the same.

"R. V. (without glasses) 6-24; with  $-1.5$  D.—6-9.

"L. V. (without glasses) 6-36; with  $+1.5$  D.—6-9.

"Field of vision has never been carefully taken."

In a third case, which was sent me by Dr. Chamberlin, of St. Paul, the treatment produced no beneficial result. This patient became discouraged after six weeks or two months treatment, and falling into the hands of "faith-healers," discontinued treatment, so that I do not consider, in view of the fact that the trouble was of long-standing, that the treatment was given a fair trial in this instance. I subjoin notes by Dr. Chamberlin upon the case.

"X. Y., aged 46, general office man in R. R. Land Dept. Came to me in April, 1890, complaining of a strained feeling about his eyes.

"R. V.—20-100ths.

"L. V.—20-200ths.

"Myopic astigmatism of about two dioptries in each eye; this corrected gave him R. V.—20-30, but did not improve the left, save, as he said, to brighten it up a little. His work being largely reading of correspondence and examining fine

lines on the maps and fine figures in books, I prescribed rest in addition to change in his glasses; the latter he obtained but the former he did not take.

"In giving his history he said that six years previous while his eyes were undergoing an examination, he found that he had very little vision in his left eye, something he had not known before. The ophthalmoscope showed the left disc to be very pale and the vessels reduced in size. The right disc however seemed nearly normal. He returned to his work and had no trouble with his vision until about June, 1891, when he returned to me saying that his vision was getting bad in the other eye. He had been working very hard and was reduced physically, so I advised immediate rest. The retina and optic disc of the right eye were in an irritable and somewhat congested condition. After a month's rest, though physically improved, he could see absolutely no improvement in his vision, which at this time equalled only part of 20-40ths. with the right eye, the optic disc being paler than normal and the vascular condition being somewhat reduced. I put him upon potassium iodide and strychnina, hypodermically and also by the stomach. I referred him to Dr. Riggs for treatment.

"Sharpness of vision slowly decreased. September 20 it was only a guess at 20-40ths; September 30 it was only 20-50, and by November was reduced to 20-70. About this time he passed out of my care."

I am at present trying voltaic alternatives in a

number of cases representing various forms of brain disease, but the experiments have not yet been sufficiently prolonged to justify me in recording my opinion as to results.

The stimulating effect of this current and its influence on nutrition are evident if one considers it in its physiological aspect. That the reversal of the polarity of the electrodes in its use is much more energetic than the simple closures is very evident if one understands the nature of the phenomena.

De Watteville ("Medical Electricity" p. 108) says: "When the electrode on the nerve is alternately changed from anode to kathode and from kathode to anode, a series of closure excitations are given, which fall alternately in the polar (when the electrode becomes kathodic) and the peripolar (when the electrode becomes anodic) region respectively. Now in either case the excited region had just before been under anodic influence, and physiology teaches us that, as we shall presently demonstrate on the human nerve, the instant the polarizing current ceases to flow the anodic region passes into a state of increased excitability. This augmentation is the more marked the longer the anodic influence has lasted. We see, therefore, how it is that voltaic alternatives act more powerfully than simple closures of the circuit, and that their action is intensified by previous current duration. We understand also why rapid reversals are the more effectual; for the positive modification after an electrotonus diminishes rapidly after the circuit has been broken; the longer the interval which

elapses between the polar change of the electrode the less the hyperexcitability of the nerve will be, until it has returned to its normal state."

The above quotation will be rendered clear by the following cut and the accompanying explana-

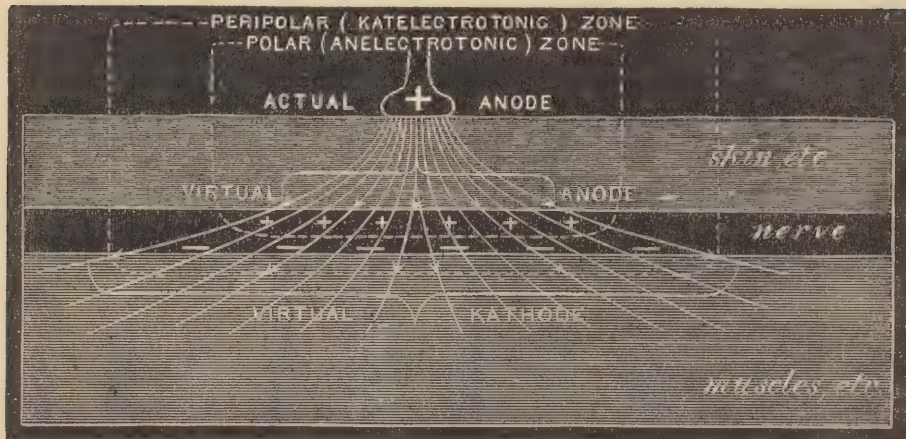


FIG. III.

Diagram to illustrate the points of entrance and exit of the current in a nerve submitted to percutaneous excitation with one electrode, and the consequent formation in it of two zones of opposite electrical character, anodic and cathodic.

tion from De Watteville's "Medical Electricity," page 102.

Althaus ("Medical Electricity," p. 225) emphasizes also the fact of the increase of excitability when the voltaic alternatives are frequently repeated.



In this article I have only designed to be suggestive and to stimulate my confrères to investigation, that the true value of this therapeutic measure may be thoroughly ascertained. If in the use of voltaic alternatives has indeed been found the remedy for even a part of the cases of atrophy of the optic nerve, the fact cannot be too soon established or too widely known.

“When the human nerve is placed under the influence of a pole applied to the skin over it, the distribution of the cathodic and anodic influence is very different. The nerve being no longer isolated, but surrounded with various tissues, the bulk of which (muscles) are better conductors and of much larger diameter than itself, the laws of derived (or diffused) currents make it at once plain, that no such localization of the current is possible as exists in excised nerve. The diagram shows what occurs. Directly under the electrode the current in the nerve obtains its greatest density: this region (marked  $-||-||-||-$ ) we may conveniently term the *polar zone*, and is necessarily of the same sign as the actual or apparent electrode (cathodic if the latter be the cathode, anodic if it be the anode). Suppose E (electrode) to be anodic; owing to the considerable diffusion of the current from the nerve into the muscles, etc., the nerve at a very short distance from the electrode is practically devoid of current. The current which has entered it in the polar zone P, has left it in a *peripolar zone* — — —. Now from the definition of the terms anode and cathode, (*i. e.* points of entrance and points of exit of a current into and from an electrolyte), as the polar zone was anodic so the peripolar zone was cathodic. By placing the actual electrode on the skin over the nerve, we have therefore created two *virtual* electrodes on the nerve, and which may be defined as the portions of the tissues surrounding the nerve from which and into which the current passes in its course through the nerve. They are represented in the diagram by the two brackets.”





